Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims

1. (Currently Amended) A management method of network devices, comprising the following steps of:

(A) establishing IP data channels via a cluster management device between network devices in a cluster and a network management device by the cluster management device, the cluster management device configuring the network devices with a data structure comprising the following fields:

network type, identifying a type of network that the network device is located in; and

physical address, identifying a physical address of the network device within the network;

wherein at least one of the network devices in the cluster is designated as the cluster management device and configured with a public IP address; the network devices in the cluster are configured and updated with private IP addresses and routes by the cluster management device; and

(B) managing the network devices in the cluster through said IP data channels via the cluster management device by said network management device.

2. (Original) The method according to claim 1, wherein said cluster management device configures and updates other network devices with private IP addresses and routes according to information of topological architecture of the network and device information of the network devices in the cluster.

3. (Original) The method according to claim 2, wherein said cluster management device configures the other network devices with private IP addresses dynamically.

4. (Previously Presented) The method according to claim 1, wherein said cluster comprises a plurality of said cluster management devices, and one of the cluster management devices is responsible for managing the configuration and update of private IP addresses and routes of the network devices in the cluster as well as the communication between said network management device and the network devices in the cluster; in case said cluster management device fails, one of the other cluster management devices is designated to be responsible for managing the configuration and update of private IP addresses and routes of the network devices in the cluster as well as the communication between said network management device and the network devices in the cluster, according to a predetermined policy.

5. (Cancelled)

6. (Original) The method according to claim 4, wherein in step (A), said cluster management device establishes IP data channels via said cluster management device between the network devices in the cluster and said network management device with network address translation technology.

7. (Original) The method according to claim 4, wherein the plurality of network devices compose a cluster through the following steps:

(1) designating a device in the network as the cluster management device and configuring the device correspondingly by the network management device;

(2) initiating a topology acquisition process to acquire information of topological architecture of the network within a specified number of hops in the network by the cluster management device;

(3) designating candidate devices to be added to the cluster in the topological architecture according to the information of topological architecture acquired from the cluster management device, and informing the cluster management device to start the cluster member device addition process by the network management device;

(4) adding the designated candidate devices to the cluster and configures the candidate devices correspondingly by the cluster management device, so as to make the candidate devices become member devices of the cluster;

(5) after the cluster is established, managing the member devices in the cluster by the cluster management device, and forwarding management messages which are from outside of the cluster and destined to the member devices through standard Network Address Translation (NAT) process to corresponding member devices to process, and processing the management messages according to normal processing process by the member devices.

8. (Previously Presented) The method according to claim 7, wherein said configuring the cluster management device correspondingly as described in step (1) includes configuring the following items on the device: cluster name, enable state of cluster, management IP address pool of cluster, state retention time of cluster, handshaking time interval of member devices, role of the cluster management device in the cluster, and IP address of the cluster management device.

9. (Original) The method according to claim 7, wherein the process of adding candidate network devices to the cluster in step (4) comprises:

(A1) sending cluster addition requests to candidate network devices that can be added to the cluster by the cluster management device;

(A2) determining whether it can be added to the cluster or not according to its own condition by each candidate device; if the candidate device can not be added to the cluster, feeding back a reject response and terminating the cluster addition process; otherwise feeding back an accept response to the cluster management device;

(A3) after receiving the response from the candidate device and if the candidate device agrees to be added to the cluster, sending a configuration message containing private IP address, member number, handshaking interval, state retention time, etc. to said candidate device by the cluster management device; after receiving the message, configuring the candidate device correspondingly, and sending a complete response to the cluster management device after the configuration.

10. (Previously Presented) The method according to claim 9, wherein in step (A2), determining whether the candidate device itself can be added to the cluster is implemented through determining whether the candidate device has already been in another cluster and whether software version in the candidate device supports cluster management.

11. (Previously Presented) The method according to claim 9, wherein in step (A2), before feeding back the accept response to be added to the cluster to the cluster management device, the candidate device will determine whether a super user password is set on itself; if a super user password has not been set, the candidate device feeds back the accept response message to be added to the cluster directly; if a super user password has been set, the candidate device feeds back an authentication request to the cluster management device; then, the candidate device authenticates itself according to the authentication information sent from the management device; if the authentication is successful, the candidate device feeds back the accept response to be added to the cluster; otherwise feeds back a reject response to be added to the cluster to the cluster management device.

12. (Original) The method according to claim 7, wherein the necessary configuration for each member device added to the cluster in step (4) includes configuring each member device with the following items: member device number, private IP address of member device, name of member device, state of member device, operating state of member device, and cluster management password.

13. (Cancelled)

14. (Currently Amended) A cluster management apparatus for network devices comprising: a cluster device manager and a member device connected with the cluster device manager, wherein:

the cluster device manager comprises:

an address translation module, adapted to perform network address translation for management messages of member devices;

a Dynamic Host Configuration Protocol (DHCP)-like module, adapted to accomplish allocation of private IP addresses to member network devices;

a first cluster member management module, which is connected with the address translation module A11, the DHCP-like module A12 and a topological information processing module A14 individually, and adapted to manage member network devices in a concentrate manner, and to forward management messages, which are from outside of the cluster and destined to member devices, to respective member devices to process, so that the member devices can process the management messages according to normal processing process;

a first topological information processing module, adapted to detect the topological architecture of network and to acquire the information of topological architecture of network within a specified number of hops in the network;

the member device comprises:

a second cluster member management module, adapted to accomplish cluster management at the member device end; and

a second topological information processing module, adapted to accomplish detection of adjacent devices and response/forwarding of topology acquisition requests;

the cluster device manager configuring the member devices with a data structure comprising the following fields:

network type, identifying a type of network that the member device is located in; and

physical address, identifying a physical address of the member device within the network.

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